

REFRESH CONTROLLER AND ADDRESS REMAPPING CIRCUIT AND METHOD  
FOR DUAL MODE FULL/ REDUCED DENSITY DRAMS

ABSTRACT OF THE DISCLOSURE

A dual mode, full density/half density SDRAM includes a refresh controller specifically adapted to refresh memory cells of the SDRAM in the half density mode at a rate that is significantly slower than the rate at which the memory cells are refreshed in the full density mode. In the full density mode, the refresh controller increments a counter at a rate that is half the rate the counter is incremented in the full density mode. A refresh trigger pulse, which initiates the refresh of the memory cells, is generated when the counter has incremented to one of a first counter stage in the full density mode and a counter stage two stages beyond the first counter stage in the half density mode. Circuitry is also provided for ignoring some auto-refresh commands applied to the SDRAM in the half density mode so that the memory cells are also refreshed less frequently in the auto-refresh mode. The SDRAM also includes circuitry for remapping one of the row address bits for use as a column address bit in the half density mode so that the SDRAM can interface with system adapted for conventional dual mode SDRAMs.